THE PROBLEM OF THE MILK SUPPLY.

F. LAWSON DODD

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BY

F. LAWSON DODD

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PREFACE

It is not intended in the following pages to give more than a brief summary of a question the importance of which is becoming daily more apparent. Great care has been taken to avoid overstating the dangers attendant upon the ignorant and unhealthy methods of milk-production which at present prevail throughout the country. The prevention of milk-borne disease, and the bringing of a clean and pure milk-supply within the reach of the poorest classes, are the ends to be aimed at. For the first, the better education of the producer, fairer remuneration for dairy employés, and more capital expenditure on the farm, are imperative conditions of progress. To attain the latter object there must be such organization of production and distribution as will effect great economies, and thus counterbalance the increased cost entailed.

Whether private enterprise can meet the difficulty remains to be seen; but whether it can ultimately do so or not, the matter—viewed in the light of the serious physical unfitness shown to exist among a large section of the people—is of such urgency as to demand immediate action. For the supply, then, of the poorer classes, it seems that the only possible solution lies in the extension and development of such Municipal Milk Depots as have already been set up in many towns. In connection with these, model farms should be established where the dairy industry could be taught and fostered under the best possible conditions, and from which a cheap, plentiful, and pure supply of fresh milk could be brought within the reach of even the very poor.

My thanks are due to Dr. G. F. McCleary and Mr. Will Reason for much kind and valued help.

F. LAWSON DODD.

41, WIMPOLE STREET, W.
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CHAPTER I.

PHYSICAL DEGENERATION.

THE attention of all social reformers is being directed to the question whether or not there are any reliable signs that we are, as a nation, becoming physically degenerate. It is significant that this discussion is being carried on in face of the fact that the general death-rate has fallen from 22·4 in the period 1841-1850 to 18·2 in the decennium 1891-1900, and also that there has been an admittedly enormous improvement in the general health condition of the people, brought about by public health and factory legislation. Although at first sight these facts would seem to be conclusive evidence against the theory of national degeneracy, i must be borne in mind that a large amount of degeneration is compatible with an average increasing duration of the individual life. Indeed, one tendency of modern preventive and philanthropic institutions is to maintain for a much longer period than was formerly the case the lives of the physically unfit. Convalescent homes, asylums, and hospitals for chronic diseases and incurables, all tend to maintain, in a low state of vitality an increasing population that a century ago would have succumbed to the rougher treatment of that time. Such things may only hide degeneracy behind a more favourable death-rate.

Then, again, it is useful to examine the death-rates at different age-periods. If we do this, the first thing we find is that, although the annual average death-rate for all persons fell from 22·4 in the decennial period 1841-1850 to 17·7 in the five years 1896-1900, yet the infantile mortality actually showed an increase in the period 1891-1900. Though the infantile death-rate was 152 per 1,000 births registered in the period 1841-1850, it stood at an average of 154 per 1,000 in the decennium 1891-1900. In years between these two periods this mortality has fallen, it is true, as low as 142 in 1881-1900; but the significance of the later rise to 154 becomes more apparent when we remember that the birth-rate fell from an average of 35·5 in the period 1871-1875 to an annual average of 29·3 in the period 1896-1900. There is also an increased death-rate among males over thirty-five and among females over forty-five years of age.

This increased infantile loss of life, combined with the lowered birth-rate, has been taken in hand on the continent of Europe as a serious matter which threatens to undermine national vigour and race ascendency—even survival. This fact alone reveals the existence of conditions deleterious to the growing generation, as well as the presence of parental degeneracy.

But this lowered general death-rate should be examined qualitatively as well as quantitatively, and by doing so we find a striking decrease in mortality from certain diseases, as, for instance:

ANNUAL DEATH-RATES PER THOUSAND.

	1866-1870.	1896-1900.
Phthisis - - - -	2·45	1·32
Scarlet fever - - -	0·96	0·134
Enteric fever (71·75) - -	0·37	0·174
Typhus fever (71·75) - -	0·08	0·001

There is no reason to doubt that this decrease is the direct result of sanitary legislation and administration.

But there is another side to the story. The mortality from certain other diseases has at the same time shown an increase. For instance:

Annual Death-rates per Thousand.

	1866-1870.	1896-1900.
Diphtheria - - -	0·13	0·272
Cancer - - - -	0·40	0·800
Diabetes - - - -	0·03	0·081
Bright's disease - - -	0·106	0·278

It is open to question whether those diseases which show an increase are better evidence of national degeneracy than those which show a decrease are evidence to the contrary. It is, however, without question that there is a large increase in insanity, after making all allowances for improved diagnosis;* and the suicide rate has shown a distinct rise.

Apart from the evidence of the Reports of the Registrar-General, the case for physical deterioration receives support from the Report of the Director-General on the 'physical unfitness of men offering themselves for enlistment.'† It is here pointed out that 'a very large proportion of the men who offer themselves for enlistment are found to be physically unfit for military service.' According to this authority, 'the impairment of vigour and physique among the urban poor is easy to understand when we reflect that, in addition to their only being able to *provide themselves with food insufficient in quantity and probably poor in quality*, their poverty also entails unhealthy environment — *e.g.*, defective housing, overcrowding, and insanitary surroundings.' The Inspector-General of Recruiting, in his Report for 1902, expresses anxiety as to the future with regard to the gradual deterioration of the physique of the working classes, from whom the bulk of recruits must always be drawn. The physical standard for enlistment into a line regiment is by no means a high one, yet during the decennial period 1893-1902, of 679,703 men offering themselves for service, 234,914 were rejected as physically unfit. It is true that the rate of rejection decreased from 40 per cent. in the first year of the period named to 30 per cent. in the last; but against this we have the fact that the numbers of those rejected within three months after enlistment, as well as of those breaking down before the first two years of service is completed, have both considerably increased. Adding together all the rejections up to the end of the first two years of service, we find that nearly 28 per cent. of those who offered themselves have proved unfit for military service. Nor does this include the large number who are so obviously defective as to be discarded even by the recruiting sergeant. The fact is that about 77 per cent. of the population of England and Wales live in towns—*i.e.*, about 22,000,000, and of these about 6,000,000 appear to be living in actual poverty, and so as to be unable to maintain, under present circumstances of sanitation and food-supply, a condition of physical fitness, and the bulk of recruits belongs to this class.

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* *Vide* Lecture by Dr. R. Jones, *Society of Arts Journal*, March, 1903.

† Parliamentary Paper [P. 1501].

In the Report of the Royal Commission* on Physical Training (Scotland), it is observed that 'there exists in Scotland an undeniable degeneration of individuals of the classes where food and surroundings are defective.' The Physical Deterioration Committee† reports to the effect that there exists a widespread physical deficiency among the poorer classes, but that the data are insufficient to found any conclusions as to the existence of actual deterioration. ‘It may be as well to state at once,’ says the Report, ‘that the impressions gathered from the great majority of the witnesses examined do not support the belief that there is any general progressive physical deterioration.’

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* 'Royal Commission on Physical Training (Scotland) Report,' p. 30, etc.

† *Vide* Report of the Inter-Departmental Committee on Physical Deterioration, 1904 [Cd. 2,175].

As might be expected, the opinions of experts are widely different. In a recent discussion at the Society of Arts, Dr. Robert Jones stated that in his opinion, based upon a long experience as medical officer to a large lunatic asylum, physical and mental degeneration did exist, while the President of the Royal College of Physicians expressed the view that there was doubtless great physical deficiency, but no actual degeneration ; and, after all, the main usefulness of the discussion lies in the fact that attention has been drawn to the very lamentable physical condition prevalent among the bulk of our town population at least. Physical development, then, among a large section of the people, is very defective, and the time is ripe for a close inquiry into its cause, and a drastic application of the remedy, if we are to continue to maintain a first position among the nations of the world.

CHAPTER II.

THE FOOD FACTOR.

FROM a public health standpoint, the three factors of environment which require careful attention in order to secure normal physical development may be roughly said to be housing, water-supply, and food. Great attention has been paid to the two former, and in these matters a real advance has been made, chiefly, be it noted, through the action of the municipal authorities throughout the country. It cannot be denied that in many respects the food-supply of the people—thanks to sanitary legislation, and to a general lowering of prices—has undergone some improvement. The relative importance of the three factors just named varies, however, with different sections of the community. While for the adult population water-supply and housing are the more important, the question of food-supply is a more pressing one with that portion of the community which is below the age of two years ; and while there has been a very great advance in the quality of the water and food-supply of the adult population, the supply of food for the very young has actually deteriorated in quality, in spite of legislation.

Before passing to the reasons for this, it would be as well to bear in mind that during the first two years of life the physical *foundations* are being laid on which the frame is afterwards to be built. Certain structures, such as the permanent teeth, are being finally formed, and the increase in weight is proportionally greater than at any other time of life. Between birth and five months the body-weight doubles, and it is trebled in a year or fifteen months after birth.

It is for this period of life that there has been a lowering in the quality of the food-supply, due mainly to two reasons—first, the decline in the number of breast-fed children; and, secondly, the movement into the towns has brought about conditions in regard to milk-supply and storage which have reduced the wholesomeness of this staple food of early life.

Cow's milk is by far the most important and valuable food for young children; and for infants when the natural food cannot, either for economic or physical reasons, be supplied, it often constitutes the exclusive diet for the first six months of life. In any given year it may be said that a population of many scores of thousands of persons is, in England and Wales, being entirely fed on cow's milk, and this part of the population is far more susceptible to defects in diet than any other. Further, this period of life is the most risky, from the standpoint of mortality, of any period up to seventy-five years, and the risk of death is largely due to errors in diet. In the year 1901, for the age-period of 0 to 5, the annual death-rate was 54·13 per 1,000, while for the same age-period the death-rate from diarrhœa alone was no less than 10·27 per 1,000.

The main result of the urbanization of the population has been to increase the distance between one important section of the population and its food-supply at a time when this supply consists of a material peculiarly liable to pollution and deterioration on its way from its source. This fact is proved to be one of the causes of the high rate of mortality from diarrhœa in urban districts, and without doubt increases the mortality of children under five years, which is so much higher in towns than rural districts. Dublin has a very high infantile mortality, and Sir Charles Cameron, the Medical

Officer of Health, regards this as being due to the consumption of milk in a state of partial decomposition. It is no exaggeration to say that the whole of infantile vital statistics would be revolutionized if only this easily preventable disease—diarrhœa—were eliminated.

In addition to the fact that milk is the main food of the population under two years of age, it also forms a greater or lesser proportion of the nourishment of children at school age, as well as that of nearly all invalids and delicate persons ; it is the staple diet of the young and delicate, as well as a less important factor in the dietary of the mature and healthy. Hence it will be seen that the greatest care should be exercised in its production, storage, and transit, and that any serious defect in either of these processes will tell not only in increased infantile mortalities, but also in physical deterioration of the children, especially of the poor.

CHAPTER III.

HOW MILK IS PRODUCED.

THE gathering-grounds from which we collect our milk are as important as those from which we obtain our water, and their proper care and attention are as important to the public health. It may also be said that while the sources of water cannot be contaminated from within, the sources of milk can be so altered: the cow itself may, and frequently does, supply, *ab initio*, a dangerous commodity.

Nearly all the milk supplied to towns comes from areas outside their boundaries, and often these areas are separated by long distances from the towns concerned. It may be said generally that the larger the town the wider the area from which it will obtain its milk-supply. London receives milk from Sussex in the south to Yorkshire in the north, and from West Somerset and Gloucestershire as well as Norfolk and Lincoln. The milk is collected from these areas by wholesale dealers, and is again distributed by them to the retailers, who again distribute to their customers. It is thus in the course of its journey to the consumer, at one time or another, in the hands of—

1. The farmer;
2. The railway company;
3. The wholesale dealer; and
4. The retailer.

Often there can be added to these the rural milk agent as well, as another intermediary between the farmer and the retailer.

It will be instructive to review the conditions common among the initial producers—the farmers. Space only permits a few illustrations, but there is ample evidence to show that this part of the process of supply is in the hands of men very largely ignorant of the necessary precautions for the safety of the consumer.

Dr. Leslie Mackenzie, Medical Officer of Health for Leith, in an article on 'The Hygiene of Milk,' says:*

'To watch the milking of cows is to watch a process of unscientific inoculation of a pure, or almost pure, medium with unknown quantities of unspecified germs. Everywhere throughout the whole process of milking the perishable, superbly nutrient liquid receives its repeated sowings of germinal and non-germinal dirt . . . and this in good dairies. What must it be where the cows are never groomed and the udders are never washed, where the byres are never even approximately cleaned, where ventilators are never opened, where the pigs are a few feet away, where cobwebs are ancient and heavy, where hands are only by accident washed, where heads are only occasionally cleaned, where spittings are not infrequent, where the milker may be a chance comer from some filthy place, where, in a word, the various dirts of the civilized human are at every hand reinforced by the inevitable dirts of the domesticated cow?'

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* Mackenzie, 'The Hygiene of Milk,' *Edinburgh Medica Journal*, 1898.

The following is from an account of a dairy farm outside a large provincial town, quoted by the Commissioner of the *British Medical Journal*:*

'The operation of milking was in full swing, three dirty-looking boys being hidden away behind their respective cows. . . . I looked about for pails of water, soap, towels, or any-thing which might give the lie to the filthy state of the cows' udders and the milkers' hands, but in vain. The clothes which the boys wore were equally dirty, and the stalls, which they were supposed to have been cleaning out while I was waiting, were several inches deep in manure and foul-smelling straw. . . . The hind-quarters of the cows were coated with filth. . . . I was horrified to see the filthy state of the milk as it flowed out of his pail. It was discoloured with grit, hairs, and manure. "Look at that," I said, pointing to a specially large bit of manure. I regretted my zeal, for Tom dipped his whole hand into the pail, and, as he brought it out, said: "Oh, that ain't nothing; it's only off the cow!"'

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* 'The Milk-supply of Large Towns,' *British Medical Journal*, 1903, pp. 11 and 12.

The Medical Officer of Health for Finsbury, Dr. Newman, has recently collected evidence as to the condition of the sources of milk-supply in his district.* For instance, the Medical Officer of Health for Stoke-on-Trent reported in 1900 that the cowsheds in his district were, in nearly every instance, overcrowded; in few was there any attempt at cleanliness, and in some cases they were filthy. Immense accumulations of manure were within a few feet of the doors, and the drainage was very defective.

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* Report on the Milk-supply of Finsbury, 1903 (Dr. Newman).

In the same report (of Dr. Newman), the Medical Officer of Health of another part of Staffordshire writes :

'Milk is brought in large churns from the country, but no provision is made for storing cans and cleansing them other than will be found in the ordinary working-man's house. The cow-keepers do not make any special provision, using their washhouses, and in some cases the cellars, in which to keep and wash the cans. . . . I am satisfied that the class of cow-keepers in this district, with one or two exceptions, have a very hazy idea of the importance of making separate provision for storing the milk and pails. . . . With regard to the cow-sheds which I have seen, the regulations might as well have never been issued. Any working-man who can afford it thinks he knows how to keep cows . . . the consequence is that they rarely get groomed, and you find their hind-quarters plastered all over with manure, and slop and filth lying all about the place. At some of the cowsheds I have found the place at almost tropical heat, with slop and filth lying about, and the cow-keeper protesting that the heat and smell were both good for the cattle.'

This seems to represent the general condition of the Staffordshire gathering-ground.

The medical officer to the Leicester County Council reports :*

'In these districts, where registration is not kept up-to-date, any man may with impunity commence to sell milk, no matter from what source obtained,' and in this part of the county regulations also seem to be non-existent.

In a veterinary report on the sources of the Manchester milk-supply,† — viz., Cheshire, Derbyshire, and Staffordshire—we learn :

'The great majority of the cows and cowsheds were in a very dirty condition, and a considerable number of cows examined, while not suffering from tuberculosis of the udder, were certainly otherwise tuberculous. The farms, in fact, with few exceptions, were totally unfit for dairy farms ; only a comparatively small proportion of the milk was sent to Manchester, the remainder, a very large quantity, being sent to London.'

It is also true that the condition of dairy farms in Ireland is as bad, or even worse, than that of English farms.

In a recent inspection by two officials of the

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* Dr. Newman's Finsbury Report quoted.

† Report on the Health of the City of Manchester, 1902.

Local Government Board (England),* it was reported that there was very little control exercised in Ireland generally with regard to the sanitary condition of dairies and cowsheds, which was in no sense creditable; examples of cleanliness were few and far between. The filthy and insanitary condition of many of the Dublin cowsheds is specially mentioned. It is stated that the farmers would often neither cool the milk nor strain it. Quoting at random from a list of farms actually visited, we have such remarks as :

> 'Farm I. Cowshed very dirty, floor being littered with filth. House in which the milk is separated and butter made, deplorably dirty.'
>
> 'Farm II. Milk twice strained, and still dirt left in it.'
>
> 'Farm IV. The whole place was incredibly dirty.'

And again—

'The farms seen on the way to —— were very dirty, both as to sheds, mud floor, yards, and milk storehouse. We saw several of them, and all were alike in the matter of filth.'

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* *Vide* Parliamentary Paper, [Cd. 833], Appendix IV. Report on a visit to Ireland by Dr. Bulstrode and Professor Tunnicliffe.

It would be incorrect to say that there are no model dairy farms in this country. They undoubtedly do exist, but they do not protect the people from the dangers of—what form the vast majority—insanitary and badly-managed ones. The Commissioner of the *British Medical Journal* can only mention two good examples of dairies supplying London, and in their cases proper farm conditions are insisted on under the terms of the contract made by each company. And it is significant that one of these companies has to reject more than one-half of the farms otherwise suitable owing to their faulty water-supplies.

There are also some model farms and dairies in Ireland, but under the present conditions of supply, which generally entails the mixing of milk of different farms, the good of these establishments is neutralized by the existence of the badly-managed ones. In short, the customer does not know the condition of the retail store, the retail dealer is ignorant of what is done by the wholesale dealer, and the wholesale dealer neither knows nor cares what conditions hold in the many farms from which he receives his daily supply.

CHAPTER IV.

MILK TRANSIT.

WHILE in the first stages of production of milk in this country there is, with few exceptions, a singular absence of organization, system, and proper precautions against contamination, in the second stage of its journey from producer to consumer things are little, if any, better. The milk produced at hundreds of smaller or larger farms is collected into 'churns,' after having been strained and more or less cooled, and is delivered at country railway-stations to await the arrival of a 'milk train,' which will convey it to its next destination—viz., the wholesale milk dealer.

The churns or cans in which it is conveyed are frequently left standing in dusty and exposed places, often in the heat of the sun, for an indefinite period. It is then packed into vans which are in many cases quite unsuitable, being closed and unventilated, and in summer-time very hot. The churns are very rarely locked, and are liable to be opened and the contents inspected by the company's officials—a process which has been known to lead to adulteration and theft, as well as contamination of the milk. The railway companies are quite willing that the churns should be locked if the farmers will consent to paint in plain figures the tare on each can—a precaution which they do not trouble to carry out, and to which the wholesale dealer seems indifferent. To illustrate one result of this want of system and care, we may mention the recent case of a Midland railway porter* who was caught in the act of taking two gallons of milk from a churn at St. Pancras and replacing the rich milk by an equal amount of water from a dirty pail. When given into custody the prisoner said, what was probably true, that a retail milkman had asked him for the milk, and had promised him sixpence for it.

The milk is received at the railway-stations either by wholesale or, less often, by retail dealers; in the former case it is manipulated and distributed to retail dealers, and these again sell to smaller retailers, as has already been described. Between the producer and

* *Vide* report, *Standard*, April 6, 1904.

the consumer there are often as many as four middlemen. This multiplication of 'hands' through which the milk passes is bad from more than one standpoint. First, it tends to raise the price of the milk by the taking of several intermediate profits; then it tends to delay its distribution, it makes the task of tracing out tainted sources of supply an impossibility, it adds to the chance of adulteration and the possibility of contamination and pollution. The milk-supply of the poorer classes is, then, the most liable to be defective in quality and high in price, and it is among them that the highest rates of infantile mortality are recorded.

'What is the state of the milk by the time it reaches the jugs of these poor people? First, at the farm there are the risks of foul water, bad drainage, dirty, contaminated sheds, unhealthy or dirty cows, dirty hands of milkers, unclean machinery or churns. Follow the churns to the station, when, in summer, they may lie in the sun for hours waiting for the train, to be, perhaps, put into ordinary box-vans and closed in beside strong smelling substances. Then there are the manifold risks of unsealed cans, the milk in which is at the mercy of any unscrupulous person. Things are known about the "accidents" to milk in unsealed churns impossible to write. We now arrive at the termini, whence the churns are taken by the wholesale dealers to their factories, to be cooled and dealt with. It is not impossible that large doses of (let us hope clean) water are added, and, in not unknown cases, where the demand is greater than the supply, tinned unsweetened condensed milk diluted. The next stage is the retail dealer, who in many cases passes on part of the milk to still smaller shops, who dabble in it with dippers, take out their supply from the counter, where the milk lies in open vessels, while the remainder once more faces the dust and heat of the streets, and finally reaches the poor people's houses. Picture the state of the milk when it is finally given to the babies, after, perhaps, passing through a long tube-bottle. This is the manner in which milk is commonly handled in the large towns of England.'*

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* 'The Milk-supply of Large Towns,' *British Medical Journal*, 1903.

CHAPTER V.

MILK AND DISEASE.

It will be gathered from what has been said already that the public has to guard itself against certain dangers in connection with this particular item of food, which may be said to be the result of:

(*a*) Dangerous accidental contamination, due to carelessness and ignorance.
(*b*) Dishonesty among the dealers, especially in reference to sophistication and simple dilution of the milk with water.

That the public is paying very dearly for the lack of education and organization in that branch of agriculture known as dairy farming is only too apparent. It has already been shown that the infantile mortality is very high, and that just above this mortality record there exists a very large, although unrecorded, amount of undermining of the national physique in the younger children. But, in addition to this, it is well known that milk may be a carrier of dangerous infectious diseases. These may arise either from diseased cows, or from diseased persons handling the milk in process of supply, or, finally, from polluted water-supplies, bad drainage, etc., connected with the sources of supply and transit.

In 1900 the Local Government Board of Ireland instituted a special inquiry into 'the relation of creameries to the spread of enteric fever in Ireland'; and the medical report affirms that 'there have been repeated and detailed observations of the spread of enteric through creamery skimmed milk,' and in this report no less than fifty-nine sanitary defects noticed in these creameries are detailed.

Recently a bacteriological test of the cleanliness of milk production has been instituted. It consists in counting the number of micro-organisms which are contained in every cubic centimetre of the milk examined. On leaving the cow the number is almost nil, and in good milk produced under the most favourable conditions the number does not exceed 30,000 to 50,000. And provided the organisms are innocent, a good milk may even contain 500,000. The following table, taken from Dr. Newman's report, will show the result of samples of London milk examined in this way:

District.	Standard of Shop.	Average Number of Bacteria per c.c.
City of London -	Good class	4,800,000
City of Westminster - - -	,,	1,600,000
Holborn - -	,,	4,800,000
Islington - -	,,	1,600,000
Finsbury - -	,,	2,300,000
,, - -	Poor class	3,200,000

But while most of these organisms are non-pathogenic, at times dangerous forms may enter milk, with the most serious consequences.

There is no doubt that the main factor in bringing about the public supply of water was the enormous amount of disease, in the form of cholera and typhoid epidemics, that resulted from the old commercial methods of supply without regard to the public health and safety It is probable that the same factor will play an important part in the public control of our milk-supplies. Although we are ignorant of the whole amount of sickness due to contaminated milk, we know that the variety of diseases which can be conveyed by it is much greater than is the case with water. The cow may be so diseased that no amount of care in the after-handling of the milk is of any use in preventing disastrous results. Then the milk may become infected from the cowhouse, the milker, the water used either to clean any of the utensils, or even to adulterate the milk. Infection can take place from contact between the milk and any person suffering from an infectious disease. Infected dust may often obtain ingress into the milk, and the bacteria of disease will thus find a suitable medium for growth. Finally, the milk may be stored in a dirty larder, or near decaying animal or vegetable matter, and infect the person who consumes it.

About 200 of the *typhoid epidemics* recorded are attributed to infection through the milk-supply. One of the worst of these was in Glasgow in 1880, where there were 508 cases and 69 deaths. The dairyman in this case got his milk from thirty farms, and only one was infected. At the farm in question there were 4 cases, 1 of which was the dairymaid ; there was the usual carelessness, and as a result the epidemic in question.

It was not till 1878 that it was discovered that *diphtheria* could be spread by means of milk. In that year there was an outbreak discovered to be connected with the milk-supply in St. John's Wood, when 262 persons were attacked and 38 died. About eighteen epidemics of diphtheria have been traced to milk ; and while the existence of bovine diphtheria is still *sub judice*, it has certainly been shown that a comparatively slight disease in the cow may produce a severe epidemic of sore throats among the consumers of the milk.

Then about seventy-three epidemics of *milk-borne scarlet fever* have been traced to carelessness and want of regulation of the milk-supply, generally due to employés at farms, dairies, or milkshops either suffering from the disease while at their work, or bringing infection from their homes. In some cases the outbreak was in all probability due to disease in the cows.

Reference has already been made to the high rate of mortality, especially among infants, from *diarrhœa.* In 1901 there were no less than 30,121 deaths from this cause alone, making a rate of 921 per 1,000,000. In London in 1902 2,504 deaths were recorded as due to this cause. In Brighton in 1901-1902 there were 226 deaths, and it was possible to trace 191 of these fatal cases to the milk-supply. This disease, whose incidence and fatality are especially high among the poorer classes of the large towns, is due to contamination of milk and other foods by poisonous bacteria, which breed in filth and refuse, and which, especially in hot weather, are swallowed by the sufferer in large quantities.* That the fatality from this cause is highest in the hottest quarters is not surprising; in fact, in a period extending over seventeen years, the following percentage of the total deaths recorded during the third quarter of the year in certain great towns was due to diarrhœa alone:†

Derby	...	...	74 per cent.
Portsmouth	...	...	76 ,,
Leeds	...	...	78 ,,
Liverpool	...	...	82 ,,
Leicester	...	...	84 ,,
London	...	...	76 ,,

Severe outbreaks of this disease have been traced to milk which was contaminated by being produced and kept under dirty conditions, and have been recorded in Manchester in 1894, and at St. Bartholomew's Hospital in 1895 and 1898. Where infants are concerned it is proved beyond question that the main mortality is among children artificially fed.

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* 'Annual Report on the Health of Brighton, 1902,' p. 48.

† 'Study of Epidemic Diarrhœa' (Arthur Newsholme, M.D., 1900).

The Medical Officer of Health for Croydon has shown* that of the deaths from this cause occurring between the ages of six to twelve months, 11 per cent. were fed on human milk, 29 per cent. on condensed milk, and 54 per cent. on cow's milk. The manner of this pollution of milk is described by Dr. Newman:† 'We have a double pollution of milk in actual practice, one originating at the farm, one brought about subsequently. The latter may be produced by flies, or from manure-heaps, or from dust in roads and yards of towns, or from the generally filthy manipulation of the milk from the time when it becomes the property of the milk-sellers to the moment of consumption. It should not be forgotten in this relation that stale milk contains toxic properties altogether apart from, and in addition to, actual bacteria.'

But the evil is by no means all recorded in the *deaths*. As in the case of a battle field, the number of fatal injuries represents only a small proportion of the total casualties. The amount of physical deterioration among the survivors who just manage to escape being returned in the mortality table is undoubtedly immense, and accounts for a large proportion of the physical unfitness to be met with in our towns and cities, and is doing much to undermine the national health and physique.

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* *Journal of Hygiene*, 1903.

† Swithinbank and Newman: 'Bacteriology of Milk, p. 372.

It has also been established that *tuberculosis* can be spread by means of infected milk, and the disease may arise from tuberculosis in the cow or from contamination by means of dust, etc., with bacilli from human tuberculosis. The great controversy raised by Koch's statement that human and bovine tuberculosis were different diseases has recently been settled by the interim report of the expert Commissioners appointed by the Government to investigate that question. According to their opinion, tuberculosis can be conveyed from human beings to bovine animals, and hence it is highly probable that infection in the reverse way can take place. And the finding of the German Imperial Commission, appointed by the Kaiser, points to the fact that tuberculosis in animals is more analogous to that disease when found in children. This being so, we are safe in saying that a proportion of the mortality among children and infants from tubercular disease is doubtless due to the taking of infected milk, and the existence of a large number of tuberculous milch cows in the country is a grave public danger. In Manchester 9,576 cows were examined with regard to the existence of tuberculosis over a period of some years, and 0·54 per cent. of them were found to have tuberculous udders. If this rate holds good for the whole country, with an estimated number of 2,000,000 milch cows, it would give a total of 10,800 tuberculous udders. As bearing on the question of sanitary administration, it is interesting to note that of samples of milk examined for the tubercle bacillus, 2 per cent. of that produced in the City of Liverpool contained the infection, while the percentage of infected 'country' milk was 7·4. In the year 1900-1901, of 509 samples of 'town' milk, 24 per cent. were found to contain organisms associated with disease-producing milk, while of 491 samples of 'country' milk, no less than 44 per cent. contained these dangerous organisms.

In addition, then, to about 300 epidemics of scarlet fever, typhoid, and diphtheria, involving thousands of persons and causing hundreds of deaths, we have seen that a large proportion of the high infantile mortality, as well as much tuberculous disease, is to be traced to the careless, slipshod and ignorant methods of supplying the community with milk. It must be borne in mind that all this suffering and expense is entirely preventable, and that the remedy lies in the direction of effective control of the milk-supply.

It must, further, not be forgotten that the investigation of milk-borne disease, as a science, is only in its infancy. There are doubtless many diseases due to milk of whose causation we are quite ignorant at present. For instance, in November, 1903, there was a serious outbreak of sore throat, sometimes accompanied by abscesses in the neck, at Woking, which the Medical Officer of Health traced to the supply of milk from cows suffering from inflammation of the udder. The unhappy victims had been drinking the matter from these abscesses in their milk, and this gave rise to an article in the *British Medical Journal* entitled 'Pus as a Beverage.' Only in January of this year (1904) 500 persons were taken ill in the Finchley district, with the symptoms just mentioned, and it is reported* that the probable cause of the illness was the milk supplied by two unhealthy cows.

It is thus clear that serious injury results from disease due to the present system of milk-supply.

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* *Vide British Medical Journal*, March 12, 1904, p. 604.

CHAPTER VI.

ADULTERATION, ETC.

WE have seen from the foregoing what serious injury to the community has resulted from the present ignorant and chaotic method of milk production and distribution, and before making any suggestion as to the remedy it remains for us to notice some of those defects in our present system of supply, which are attributable to (1) the alleged necessities of the trade, and (2) the large amount of dishonesty in connection with it. It is impossible here to go into the question of the widespread use of preservatives used in connection with milk and butter. Boric acid,* formalin, salicylic acid, benzoic acid, or other preservative agents were found in 18·2 per cent. of the samples of milk examined for the Departmental Committee on Food Preservatives, and 77·9 per cent. of the samples of cream and 57·1 per cent. of the samples of butter were similarly altered. A common custom seems to be to add from ½ to 1 pound of boric acid to 100 pounds of butter, and in the case of milk the addition of antiseptics seems to depend on the fancy of each of the many purveyors through whose hands it passes on its way to the unfortunate consumer.

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* *Vide* Report, Departmental Committee on Use of Preservatives in Food, 1901. Col. 833.

Dr. Voelcker,* speaking on behalf of the Royal Agricultural Society, testified, from personal observation, to the haphazard manner in which both farmers and vendors add preservatives to milk. The Borough Analyst for Southampton* states that the custom in that district is for dealers to take 1 pound of preservative, dissolved in 1 gallon of water, and to add 1 pint of this mixture to every 8 gallons of milk. That means that the people of Southampton commonly take 12 grains of these preservatives with every pint of milk, and there, at all events, 'both boric acid and formalin preparations are being increasingly used.'

Mr. de Hailes,* analyst at the Dairy Trade Protection Society, asserts that there is an enormous amount of preservatives used in the milk trade in London—‘far more than anyone has any conception of.’

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* Report of Departmental Committee on Food Preservatives.

The quantity used, of course, varies with the weather, and in summer their use is much more frequent, and, if we are to believe the Report of the Departmental Committee, there is about twice as much ‘preservatizing’ on Sundays as on weekdays — in summer, at least. The amounts found by the analyst to the Departmental Committee varied, and were—

1. Of boric acid :
    Milk, 1·3 to 9·1 grains per pint.
    Cream, 10 to 57 ,, ,,
    Butter, 18 to 65 grains per pound.

One analyst had found as much as 87½ grains of boric acid to the pint of new cream from Dorsetshire.

Without labouring this point, it has been shown that there is at present no way of preventing this except by the clumsy and often unsuccessful routine of prosecutions, and that there is no safeguard to the public against even larger amounts than those recorded being added in future. It must be remembered that this adulteration with preservatives is one that peculiarly affects the main food of infants and invalids, and in the absence of a complete knowledge of their effects, the general use is to be condemned.

We are assured on this point that there is evidence pointing to the injurious effect of boracized milk on very young children, and this is the view held generally by medical authorities. There is, however, one other aspect of this question. The use of antiseptics enables stale articles of food, such as milk, butter, cream, etc., to retain the external appearance of the fresh article. New milk has the quality of absorbing injurious gases, and being a medium for the growth of all kinds of harmless and dangerous bacteria; and hence, although the use of chemicals may assist the dealer under the present clumsy methods of organization of our milk-supply, it tends to react injuriously on the public health.

To quote the words of the Departmental Committee:

'There is further objection to the use of preservatives in the milk traffic, that they may be relied upon to protect those engaged therein against the immediate results of scrupulous cleanliness. Under the influence of these preservatives milk may be exposed, without injury, to conditions which otherwise would render it unsaleable. It may remain sweet to taste and smell, and yet have incorporated disease germs of various kinds. . . .'

'It has been put before us that it is not possible to supply large towns, especially London, with new milk without the aid of preservatives, but we have abundant evidence to prove *that this is no more than a matter of organization and system.* No doubt the prohibition of preservatives in milk offered for sale would tend to the disadvantage of small retailers, who have no cold storage, *but this is not a consideration* which should stand in the way of a much-needed reform.'*

It may be added that in Denmark the use of all preservatives is absolutely prohibited, and the prohibition is enforced, even for exportation; but, then, there is some organization in the matter, and a certain regard for the public health. There was formerly a prohibitive law in France, but, at the urgent request of the English butter trade, the law was relaxed—with regard to exported butter, at least.

Sir H. Plunkett * has summed up the whole matter by saying that 'the use of preservatives puts the careless and slovenly dairymen on a par with those who are careful and cleanly.'

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* Report of Departmental Committee on Food Preservatives, 1901.

Whatever may be said of the milk trade in extenuation of the harmful practice of doctoring their milk and cream with various chemical substances, there can be no defence against the widespread and dishonest custom of faking the milk in order to increase the profits of the trade. The chief forms that this dishonesty takes are—

1. Adding water.
2. Adding separated milk.
3. Abstracting cream.
4. The watering down of condensed milk and its sale as fresh milk.

It is not too much to say that not only is the adulteration of milk, in one or other of the above-named ways, a constant practice of a considerable proportion of the trade, but it is also one that is on the increase.

In 1902* 11·6 per cent. of the milk samples taken in England and Wales were reported against, and this was the highest rate of milk adulteration recorded for nearly ten years. But adulteration, in so far as it has been brought to light, is mainly an urban phenomenon, and we find the percentage of adulterated samples dropping from 15·6 in London to 10·3 in the twenty next largest towns, and to 10 for the rest of the country. In six Metropolitan boroughs the percentage of adulteration to samples taken was no less than 20, and in the Borough of Finsbury the average percentage of adulteration to samples taken over a period of ten years was 25, or one-quarter of the whole.

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* Annual Report, Local Government Board, 1902.

The percentage of milk adulteration is, moreover, greatly raised by the appointment of specially-skilled inspectors. For example, in the case of Islington, of 385 samples taken by the ordinary inspector, 23, or 6 per cent., were adulterated; while of 547 samples taken by a special officer, 111, or 20·3 per cent., were condemned.* In this connection it is instructive to note that recently an abnormal amount of fat has been found in milk taken by a sanitary inspector who was known to the milk-sellers, and this may show the need for special care to be exercised in the taking of samples.

The old idea of adding chalk and large amounts of water to milk may be dismissed as being far too crude a method for modern commerce. Water is still commonly added, but in smaller and more discreet quantities than before the days of analysis and inspectors. A far commoner custom is to add separated milk to 'whole' milk, or to abstract a regular and definite proportion of cream. The milk trade has learned much, and among other things it knows the amount of fat that is permitted by law. The minimum generally taken for pure milk by analysts is that suggested by the Board of Agriculture — viz., 3 per cent. by weight of fat. If the milk does not contain this proportion of fat (by weight), then the purveyor must prove that it has not been adulterated. But this proportion has necessarily been made very low, and equal to the amount which would be yielded by a poorly-nourished cow. The amount of fat found in good milk is commonly about 3·5 to 4 per cent. in winter, and often amounts to 5 per cent. in summer. The standard of 3 per cent. fat suggested to analysts by the Board of Agriculture is not accepted by all analysts, and some will admit as low a standard as 2·75 per cent. of fat in a sample of whole milk. The recommendation of the Departmental Committee is that the minimum allowable should be 3·25 per cent. fat.

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* Annual Report, Local Government Board, 1902.

Vieth, late chemist to the Aylesbury Dairy Company, states that, after analyzing 100,000 samples of milk, the average per cent. of fat was 4 per cent. Now analysts report the growing practice of reducing the quality of milk so as just to meet this very low standard passed by the Board of Agriculture. For instance, the analyst for Kent recently reported that 'this reduction nowadays is done very accurately, and my experience shows that the old and grosser forms of milk adulteration are largely giving place to more refined methods of mixing "separated" with "whole" milk, so as just to escape the Board of Agriculture limit.'* The milk producer or salesman has a new and secure fund of profit, then, derived from all the fat which his milk contains over and above that of the milk of a very poverty-stricken cow; and there are experts in adulteration whose function it is to baffle the analysts.

On its way from the farmer to the consumer it is obvious that the incentive to adulterate becomes the greater the nearer the milk has arrived to the consumer. The farmer who sells at a comparatively low price would not reap so much advantage from adulteration as the small retail dealer, who buys at a high price, and must therefore find more difficulty in realizing a profit. Analyses of milk at different stages of its journey from the cow to the customer have proved this to be the case.

Wholesale milk-dealers often, in times of sudden demand or shortage of supply, boldly add water or diluted condensed milk to their stock of fresh milk. They do it on a large scale, and if the retailers are caught, which is highly improbable, they will pay the penalty for them.*

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* Annual Report, Local Government Board, 1902.

It is certain that milk adulteration is on the whole, and in spite of the fine imposed, a profitable form of trade dishonesty. The view taken by magistrates in cases of milk adulteration is so lenient that the Local Government Board, acting through the Home Office, drew their attention to this fact by means of a circular. A Walsall magistrate recently dismissed a case where there had been 7 per cent. of water added—and that without hearing the defence—as a paltry prosecution! That the practice of adulteration is profitable is shown in the 1902 Report of the Local Government Board, calculating from the proportion of adulteration shown in the year 1901 and on the basis of 144,000 imperial gallons per day (the supply of London as calculated by the Dairy Trade and Can Protection Society). This report estimates that at the current retail price of milk Londoners are paying at least £30,000 per annum for added water. On this basis the figure for the United Kingdom* would be equal to an annual tax of £240,000. But it must be remembered that this estimate is in all probability below the real figure, for, while the proportion of adulteration is higher in the great centres, in these places extra care and skill in taking samples have always added to the percentage of adulteration. Indeed, this may be the only reason why the rate in the provinces is so low. For instance, in one town of 35,000 inhabitants, in the year 1903, only twenty-one samples of milk were taken; and the fact that the adulteration was very low is certainly not a conclusive guide to the real state of things. In the matter of adulteration, it seems that the worst offender is the small dealer and milk-hawker who wanders about from district to district, and if prosecuted simply changes the name on his barrow. One of these men was not long since caught by a London sanitary inspector carrying on the same barrow as his milk a can of water, from which he replenished his stock as it was sold to the unfortunate customers. Again, the difficulty of detecting adulteration is increased by the fact that the milkman often has two receptacles from which he sells—the one containing watered or otherwise adulterated milk and the other milk of ordinary richness—and, needless to say, he generally manages either to serve the food inspector from the unadulterated can, or to inform him that the other can does not contain 'whole' milk, in which case he is held to have made a sufficient disclosure.

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* 'The Milk-supply of Large Towns,' *British Medical Journal*, 1903, p. 68. Also Report on Milk-supply of Finsbury, 1903, p. 28

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* Taking the population of the United Kingdom as 40,000,000 and that of London as 5,000,000.

But the loss to the community cannot be measured merely by the substitution of water for milk and the addition of separated to 'whole' milk. There is the cost of keeping a large staff of special inspectors and of analyzing large numbers of samples.

By deducting the penalties on the 10 per cent. of adulterated cases where convictions are obtained, which average at about £1 10s. each, from the cost of analyzing 100 samples of milk or butter, at 10s. 6d. per sample, we have a cost per 1,000 of £37 10s. This gives us a total cost of £16,125 per annum for the 43,000 samples taken and analyzed. To this must be added the cost of the inspectors employed. At an average of 800 samples per year per man, this would require fifty-four inspectors at, say, £150 per man per year, at a cost of £8,100 per annum. Thus the cost of inspection and analysis, apart from the time of clerks, medical officers, witnesses, etc., equals an annual tax on the people of England and Wales of £24,000.

But there is another sort of cost as well—viz., the injury to infant and child life from the dilution of a necessary part or the whole of their food-supply. Mothers generally 'humanize' the milk bought for young infants, and if they continue to follow the usual proportions of water, sugar, and cream, they may keep the child in a good state of nourishment; but if they are adding proportions of water and cream to adulterated milk, they may be giving the child, finally, a food which is insufficient. The analyst for St. George's, Hanover Square,* in a recent report, says: 'The actual starvation of infants may result from the fact that they cannot obtain from the preparation (milk from which cream has been abstracted) one of the substances essential to their nutrition.' There is, therefore, no doubt that the infantile mortality, especially during the earlier months of life, is due in some part to this custom of milk adulteration.

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* Annual Report, Local Government Board, 1898.

CHAPTER VII.

LEGISLATIVE ACTION.

HAVING now glanced at some of the main features of the present condition of the milk industry as carried on in this country, it is necessary to understand what has been done by the community to protect itself against danger from the spread of disease as well as against fraud.

The principal attempt to protect the public against the dangerous consequences of an ill-regulated milk-supply is comprised in the Dairies, Cowsheds, and Milkshops Orders, 1885-1899.

These orders were issued at first by the Privy Council, and afterwards by the Local Government Board, under the Contagious Diseases (Animals) Act, 1878. The conditions which their enactment aims at enforcing on the trade are:

1. Registration of all cowkeepers, dairymen, and purveyors of milk, who do a regular business with the public.

2. The proper lighting, ventilation and air-space, cleansing, drainage, and water-supply, of all new dairies and cowsheds (occupied after the order).

3. Forbidding any dairyman, cowkeeper, purveyor of milk, or occupier of a milk-shop—

    (*a*) To allow any person suffering from a dangerous infectious disease, or having recently been in contact with anyone so suffering, to milk cows, or to handle vessels used for containing milk, or to take part or assist in the conduct of the trade processes.

    (*b*) If himself so suffering, or having recently been in contact, as aforesaid, to take any part in a trade process, until all danger from communication or contamination has ceased.

4. The provision of proper drainage and sanitation for dairies, storage-room, or milk-shop.

5. Forbidding any dairyman, purveyor of milk, or cowkeeper from using any of his dairy accommodation in such a way as to be likely to interfere with its cleanliness (as, for instance, sleeping in a milk-store, etc.).

6. Forbidding the keeping of pigs in any cowhouse or dairy-room.

7. Giving power to sanitary authorities to make regulations for inspection of cattle; for insuring cleanliness in dairies and cowsheds;

for securing cleanliness of milkshops and cans, etc.; for prescribing precautions to be taken against infection, etc.

8. Providing against the sale of milk from diseased cows, or the mixing of the same with good milk, or its use for animals' food without boiling.

Under these orders, then, the local authority can become thoroughly acquainted with the conditions of the milk-supply within its own area, and can enforce improvements in the condition of cowsheds and dairies; but although in towns regulations are adopted and efforts at effective control are constantly being made, as the authority has no power outside its own area, it is in the position of being able to find polluted or diseased milk, but is practically unable to go farther and deal with the source of danger.

In most *rural* districts—*i.e.*, where cows are for the most part being kept—these orders are, generally speaking, a dead letter. Rural councils are known to hold the view that they are not going to incur the expense and odium of administering a law whose operation is entirely to the benefit of a distant urban area. In London no control over the *sources* of milk-supply is exercised at all.

Under the Sale of Food and Drugs Act

(1875-1899) sanitary authorities have power to prevent the adulteration of milk and butter, the selling of articles of inferior quality, and the sale of articles of food from which parts have been taken in such a way as to affect their quality injuriously. Under this Act we have a large sanitary police force working day and night, as well as Sundays, to detect cases of tampering injuriously with the milk-supply. In 1902 they carried through 1,939 prosecutions, and obtained 1,545 convictions, with penalties amounting to £3,700.

London has power, under the Public Health Amendment Act of 1891, to stop a milk-supply which can be proved to be the cause of a dangerous infectious disease. Now, one peculiarity of milk-borne epidemics is the rapidity of their spread, and a medical officer of health who suddenly discovers one in a London borough has to go through a series of formalities and legal technicalities which rob the Act of practically all its utility. He must obtain an order of inspection from a justice in the locality where the farm is situated (perhaps 150 miles distant); he must inspect the place in company with a veterinary surgeon; he must report to the authority; the authority may serve on the dairyman a notice to appear before them to show cause why his milk-supply should not be cut off; finally, if satisfied, the authority may issue an order forbidding the sale of his milk in their district. But the dairyman may refuse to allow inspection, and then he must be summoned at the police-court in his own district, and is liable to a fine not exceeding £5. 'But for obvious reasons,'* says the Medical Officer of Health for Finsbury, 'it might be quite worth while for an incriminated dairyman to risk such a fine if it would give him a few days' grace during which to get rid of, say, a diseased cow. Persons cognizant of the ways and means which have on occasion been adopted by dairymen to get rid of diseased cows know by experience that the tracing of such a diseased cow is a difficult matter.'

In one instance, when the veterinary inspector of Manchester discovered such an animal, the farmer pleaded as excuse that he was no longer sending his milk-supply to that city, but to London. Under this procedure, infected milk could only be excluded from London as a whole by each of the twenty-nine Medical Officers of Health going down into the country and obtaining a special order. The London County Council tried in 1902 to obtain powers for their Medical Officer of Health to exclude infected milk from the whole County of London ; but certain Borough Councils opposed the Bill, and it was thrown out by the Lords.

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* *Vide* Dr. Newman's Finsbury Report, 1903.

Provincial Sanitary Authorities have somewhat similar powers to the above granted them under the Infectious Diseases Prevention Act (1890). In this case, however, they have to give notice to the County Council concerned, and also to the Local Government Board ; and, further, the order must be at once withdrawn when the Sanitary Authority or Medical Officer of Health is satisfied that the supply has been changed or the source of infection removed.

One certain result of this Act, as well as the last-mentioned, is to cause a migration of diseased cows from one district to another, and thus to transfer the supply of diseased food from a wary and well-managed district to a sleepy and ill-managed one.

But the immense difficulty, and often the utter impossibility, of ever tracing out the actual source of the diseased milk must not be lost sight of. It has been shown that the milk from many farms, widely separated both as to quality of management and as to distance, is daily mixed by the wholesale dealers, and again separated and distributed into the districts of many Sanitary Authorities. But even supposing this initial difficulty has been overcome, and all the clumsy legal machinery has successfully reached its end, what has been done? Nothing to control the *source*, effectively or regularly; but the supply has simply been stopped after all the damage has been effected, and it is now only left for the highly-skilled sanitary staff to wait for information regarding another outbreak of disease, which they will have the labour to search out fruitlessly in the same way as before, the public meanwhile bearing the expense, and forgetting to charge it in its milk bill. While it may be profitable to the dairy farmer to keep things as they are, it is certainly a great expense to the community.

Rural Sanitary Authorities are largely composed of agriculturists, and until they can be convinced that it is profitable rigidly to enforce the most stringent regulations against fraud, ignorance, and dirt in the milk trade, it is hardly to be hoped that the legal administration of the Dairies, Milkshops, and Cowsheds Order will be greatly improved. Sanitary legislation is too often brushed aside with the sneer, 'Doctors' fads!' by those whose supposed interest is against it. 'If good enough for my father, then it is good enough for me,' is an argument that is often conclusive to the rural mind.

'If the Almighty had meant manure to be kept out of milk-pails,' said one wiseacre, 'He would have put the udder at the other end of the cow.'

It will be seen that the attempts made to control the milk trade by legal means, even if carried into operation, fall far short of the most elementary requirements. In the eyes of the law milk may contain large quantities of preservatives, such as boric or salicylic acid ; it may show a deposit of stable manure ; it may be coloured with annatto or turmeric ; it may contain pus or innumerable micro-organisms, either harmless or pathogenic ; it may be coated with dust from the street, or contain dead flies in suspension ; it may contain saltpetre, to hide the flavour of some unsuitable food given to the cow ; it may be the product of a cow fed on such fermented food as 'brewer's grains,' which renders it unfit for infants' food—it may contain all these injurious qualities and yet be legally 'pure milk.' It is true that penalties have been imposed on milk-sellers for putting large quantities of boracic acid, etc., into their milk ; but these decisions have been dependent on the opinion of individual magistrates ; hence the recommendation of the Food Preservatives Committee (Report, p. xxx), 'That the use of any preservatives or colouring matter whatever in milk offered for sale in the United Kingdom be constituted an offence under the Sale of Food and Drugs Act.'

Under these circumstances it is not surprising that there has been some reaction against these intolerable conditions.

CHAPTER VIII.

PRIVATE ENTERPRISE.

Some few dairies in London, and also in some provincial towns, have inaugurated on a small scale better conditions of production and distribution of milk.* But these have a business restricted to the wealthier part of the population, and have hardly touched the fringe of the real problem, which is to provide clean, healthy milk for the mass of the population who are unable to pay a fancy price, and who, owing to either ignorance or industrial pressure, are unable to protect themselves against the dangers of a polluted food-supply.

In York a pure milk-supply was started in 1901 under the auspices of a Citizens' Public Health and Housing Committee. This enterprise, which is worked on purely commercial lines, controls the milk from the cow to the consumer. It won the confidence of the public and the medical profession by securing cleanliness throughout all the processes of production, by having a monthly veterinary inspection of the whole herd of cows, and by delivering the milk in sealed bottles to the consumer. The cows are groomed daily and kept in model cowsheds, supplied with town water; they are fed only on foods which can in no way influence detrimentally the flavour and quality of the milk, which is cooled down to 45° Fahrenheit immediately after milking. The demand for this milk is so great that, owing to the limited capacity of the farm, the price had to be raised from 3½d. per quart for ordinary milk and 4d. for special nursery milk to an all-the-year-round charge of 4d. and 5d. per quart respectively. In spite of this, however, so great is the demand for a really reliable article that it exceeds the possibilities of supply. It may be added that the whole of the arrangements of the York dairy are very simple and not at all costly, and the only barriers to their more general adoption are trade ignorance and the need for proper industrial organization.

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* Welford's and the Aylesbury Dairies are two notable instances.

But by far the best private improvement in clean milk-supply is that found in Copenhagen. That city is supplied mainly by three companies, which distribute pure milk under the best possible conditions to the city generally. The most important was founded by a Mr. G. Busck, a manufacturer in Copenhagen, who overheard one of his workmen complaining that he had been refused milk at a public-house because he did not buy alcoholic liquor there, and that this was a general custom, and also that the milk when obtained was of a very inferior quality. Mr. Busck, having verified these statements, started a small limited liability company, with three independent directors who were to give their services. The capital amounted to £600 to begin with, and the interest was limited to 5 per cent. per annum; any profits obtained over and above this were to be devoted to reducing the price of the milk sold. At the present time the capital has increased to about £32,000, and success has been continually recorded. This company is only a distributing agency, and supplies pure, unadulterated milk to the consumers. The system is briefly this:

1. The farms supplying the milk are controlled by frequent independent veterinary inspection, by health visitors, and by elaborate contracts which lay down minutely the methods of feeding and treatment of the cows, the treatment of the milk, the times and manner in which

it must be delivered, and certain general conditions, including the right of the company to refuse unwholesome or highly flavoured milk. The farmer is also bound immediately to notify the occurrence of disease among the cows or the farm hands, and in this case the milk is to be rejected, but paid for in full by the company; if, however, no notification is sent in, the company refuses the milk and does not pay.

2. Each can of milk on arrival at the factory must not be above a certain temperature, and it is tasted by an expert milk-taster. The milk is then filtered and bottled and sealed down, and delivered in sealed carts, which are in hot weather specially refrigerated, to the various dealers, at whose doors it must arrive with the seals unbroken. The most scrupulous conditions of health and cleanliness are enforced among all employés. If one of them is ill, or has illness of an infectious character at his or her home, provided he notifies the fact to the company, his wages are paid in full during his absence; if he fails to notify, he is at once dismissed. The employés all wear special clothes at their work, and must conform to the strictest rule of cleanliness. The floors of the factory are kept cool with continually running water, and all the machinery and plant is most

carefully cleansed and sterilized daily. Milk is bought from the farmers at about 1¼d. per litre (= 1·76 pints), and sold to the public at about 2¼d. per litre. It is interesting to note that in Paris, where there are practically no safeguards in the milk-supply, the farmers are paid less for their milk by the middlemen, and the average price to the public is 4¾d. per litre, or more than double that charged in Copenhagen. In London, where the conditions are a little better, the price paid to the farmer averages in summer about 1½d. per quart, and in winter about 2d. per quart;* the price to the consumer is 4d. per quart all the year round. This Copenhagen Milk-supply Company has two rivals, in the shape of the 'Danish' and 'Trifolium' companies.

These methods of supply, containing only an outside and commercial control over the farmer, and working under the ordinary commercial system, are by no means perfect, but to an extent they represent the concentration of the milk distribution of a large city into few hands, and these worked on sound lines; and, further, they represent a commencing organization of the milk industry, and it is safe to say that 'if Copenhagen is one of the great cities of

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* The cost of transit being paid by the farmer.

Europe where at all seasons, and notably during the hotter months, the infantile mortality from diarrhœa is of the lowest, it is due to the intelligent organization of these dairies.'[*]

An illustration of a semi-philanthropic attempt on the part of an individual to solve the milk question is afforded by the 'Œuvre philanthropique du Lait,' established in Paris by Dr. Henry Rothschild about a couple of years ago, when the attention of everyone was being called to the extremely high infantile mortality in that city. At the present time Dr. Rothschild is selling pasteurized milk[†] at a price about 33 per cent. less than that demanded by the ordinary retail dealer; and in spite of the fact that this milk is of good quality, free from preservatives, and also has gone through the process of pasteurization, he is making a profit of £1,000 per annum on the milk sold in his twenty depots. He has lately added the sale of pure butter to this business, and the demand for this is beyond his powers of supply. He sells in all about 15,000 litres daily in the poorest parts of Paris, and the economy of management which permits the extremely low price is effected by careful organization and control, and the insistence on all customers coming to fetch their milk.

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[*] 'Le Lait à Copenhagen,' Dr. Rothschild, Paris, 1903.

[†] In this case the pasteurization is essential because no control whatever is exercised over the cleanliness of the farms.

Such is the demand for a reliable milk, especially for infant-feeding among the poor, that in the early morning a long line of women and children are to be seen waiting outside the various depots for their daily supply. The safeguard seems here to rest mainly on the sterilization and distribution of the milk, as in France the quality, if not the existence, of rural sanitary administration is very doubtful. But, in spite of its manifest limitation, this attempt is said, on good authority, to have effected already a substantial reduction in the infantile mortality of Paris.*

Before passing on to refer to what the English municipalities have done, one other method of voluntary control of the milk trade may be mentioned. This is called the 'Certified Milk Movement.' It consists in the formation of associations of medical men and others for the purpose of giving special certificates as to quality, purity, etc., of milk supplied by any dealer who satisfies them that he has conformed to certain conditions as to production and distribution.

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* 'L'Œuvre philanthropique du Lait,' Dr. Rothschild, Paris, 1902.

'Certified milk' is generally sold in the cities of the United States, and it must not only be free from adulteration and preservatives, but also conform to a standard of cleanliness measured bacteriologically. In this manner the Health Committee of Sunderland have attempted to secure from the private trader a pure and clean supply of milk. In return for a guarantee certificate from the Corporation, the dairymen and cowkeepers are bound to conform to a standard of cleanliness of production over and above that laid down by the Dairies and Cowsheds Orders and the regulations made under them.

The great disadvantage, however, is that, owing to lack of organization, the price of certified milk is generally only within the reach of the wealthy. And we agree with Dr. Chapin, the founder of the 'Certified Milk Movement,' that the populace would vote out of office any party that succeeded in raising the price of the people's milk.* Such a method of solution is hopeless for the poor, and therefore we are driven on toward municipal action as the final solution of the problem.

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* Chapin, 'The Theory and Practice of Infant Feeding,' Baillière, Tindall and Cox, 1902.

CHAPTER IX.

MUNICIPAL MILK DEPOTS.

The municipalities have already commenced to deal with the problem in their institution of municipal depots for the supply of sterilized humanized milk. The first depot for a supply of this kind by an English municipality was that opened by the St. Helens Corporation in August, 1899. The Medical Officer of Health took as his pattern the Goutte de Lait at Fécamp in Normandy. The cost of installation was £235 2s. 5d.; the charge for a daily supply of milk for one infant was 2d., and it was found that this more than covered the cost of materials and fuel.

Since the experiment at St. Helens, Liverpool, Battersea, Ashton-under-Lyne, Bradford, Dundee, Glasgow, and Dukinfield, have established depots, and the question is being discussed in several other places. It is needless to say that the one aim of the authorities has been the reduction of the infantile mortality from diarrhœa and other preventable diseases due to imperfect food-supply.

In all these depots the general methods of procedure are the same. Milk of a guaranteed quality is purchased by contract, and conditions as to cleanliness of production and freedom from infection are imposed upon the farmer who supplies. On the milk being received at the depots, it is strained, mixed with water, cream, and milk-sugar, in the proper proportions, and then, after being bottled, it is sterilized by means of hot steam. Finally, the bottles are sealed up, and it is generally arranged that each shall contain enough for one meal, so as to obviate the necessity of exposing the milk to the possibilities of home infection.

It will thus be seen that the municipality has had to step in and interfere with private enterprise in the interests of public health; and there is little doubt that good has resulted from these institutions, as is amply shown in the special report made by Dr. McCleary.* But all authorities are agreed that their municipal milk-supplies fall far short of what is needed.

Firstly, they have no efficient control, such as is implied by ownership, over the sources of their supplies; and, secondly, they sell only humanized milk—a preparation for which there is a limited demand, and which is troublesome to prepare.

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* Report on the Health of Battersea, 1903, Dr. McCleary.

The real solution of the milk problem is not the supply of sterilized milk of doubtful purity, but rather the supply of clean milk from sources above all suspicion. The transport of milk from long distances under present conditions as to cooling, transit, etc., may render sterilization all important; but the necessity for sterilization indicates the presence of avoidable organic impurity, and to obtain a naturally pure milk-supply is the really important thing.

It is, too, the opinion of many Medical Officers of Health that the indirect control furnished by the contract with the farmer is quite insufficient for the purpose. Dr. McCleary, at Battersea, in spite of the somewhat stringent conditions laid down, reports that, in his opinion, 'all the processes involved in the production of the milk supplied from a municipal milk depot should be under the direct supervision and control of the responsible officers of the Sanitary Authority.' Dr. Niven, Medical Officer of Health for Manchester, holds the same view, as does also Dr. Hope, of Liverpool.

The fact is that the preparation of the milk—straining, cooling, bottling, etc.—should be carried out on the farm as expeditiously as possible, and not at the centre of distribution; and only in this way is it possible to insure the best quality of milk. The Commissioner of the *British Medical Journal* says: 'The money subscribed by the municipality might more wisely be expended in establishing dairies for the supply of clean, pure, fresh milk, which in this country is all that is necessary, except, perhaps, during the few weeks of a hot summer (when we get one).'*

The experience of the city of Rochester, U.S.A., is instructive.† The city started a depot for sterilized and humanized milk in 1897, but finally the following method was adopted:

'A central station, at which the milk is prepared, is organized each season on a farm outside the city, where a trained nurse and assistants have full control of the cows, utensils, bottles, etc., and where all of the milk work is carried on in a portable milk laboratory. Everything coming in contact with the milk is thoroughly sterilized in steam sterilizers. The milk itself is not subjected to any pasteurizing or sterilizing process. Sterilizing and pasteurizing are only an open invitation to the milkman to be careless in the production and handling of the milk.'

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* 'The Milk-supply of Large Towns,' *British Medical Journal.*

† *Op. cit.*, Dr. McCleary.

This method is recommended by the Medical Officers of Health for Battersea and Croydon, and it is not too much to say that without some such action the usefulness of the depots at present established by municipal effort is considerably discounted, and such a course necessitates the ownership of the farms.

But the infant depots are not the only institution which a municipality should supply with pure and healthy milk. There are the fever hospitals, Poor-Law infirmaries, asylums, and other rate-supported institutions. In some instances such places are already supplied from municipal farms. The Corporation of Nottingham, for instance, supplies its asylum from its own herd of cows, and takes about £2,500 per year for the sales of milk and butter. Again, the Birmingham and District Drainage Board is a large producer of milk, and took last year (1903-1904) £1,894 for the sale of 61,404 gallons of milk produced on their sewage farms.

Reading also sells milk in bulk. Every

municipality has from its own institutions a constant demand for dairy produce; the sick as well as the very young both need milk of the best quality, and the time has undoubtedly arrived when municipalities should start their own dairy farms—for institutional supplies, at least. Such farms should be under the control of the sanitary departments of the local authorities, and should be worked mainly with the idea of securing a model milk-supply, free from dirt, adulteration, and disease. Such farms might be worked, also, with the idea of teaching the art of dairy farming, and be made branches of the technical schools at present worked by municipalities. In this way there would be some prospect of spreading a scientific knowledge of an industry which is hopelessly neglected, and which, owing to superior knowledge on the part of France, Denmark, Holland, and other countries, is in some danger of being all but extinguished. Foreign firms have already offered to supply frozen milk and cream free from preservatives for the home market at prices as low as they can be obtained for from the home producer,* and only a sense of loyalty to the British farmers seems to stand between us and this alien supply—at least, until Mr. Chamberlain's 15 per cent. duty on foreign dairy produce has been realized ; and even this will not do much to attain the ends indicated above.

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* *Vide* Departmental Committee on Food Preservatives Report and Appendix.

These municipal farms, then, should send a supply of guaranteed milk to all public institutions of the Sanitary Authority, and they should also supply a varying number of milk depots, which should be situated in the poorer parts of the localities in question, where 'whole,' humanized, or separated milk could be obtained at a price sufficient to cover the cost of production. It might be arranged that all milk must be fetched by the customers, and this would insure a low price, and also tend to reduce any undue competition with well-managed dairy companies which at present mainly supply the better-off classes. But it should also be remembered that a large proportion of the milk-supply of the poor is at present obtained from the various foreign brands of condensed milk, and therefore competition with private home-producers would be less than would at first sight appear ; and, indeed, it might be fairly said that we should substitute a better article of food, produced at home under the best possible conditions, for one prepared abroad under conditions over which we at least have no control.

With regard to London, the problem is an immense one, and it is obvious that no single farm could produce the 150,000 gallons which are daily required for its needs. London already possesses the nucleus of a municipal milk-supply in the well-appointed dairy farms established by the London County Council for the supply of their own immense and growing institutions. The great fever hospitals, Poor-Law workhouses and infirmaries, should be supplied from the same source; and the large privately-managed London hospitals would also be only too glad of a supply of milk of the best quality and at the lowest price. For it should not be forgotten that some of the worst milk epidemics* have occurred in these hospitals, and that under present circumstances—at least, in those cases where reasonable care is exercised—they are obliged to sterilize all the milk they receive, as they have no control over the source of their milk-supply and no knowledge of the conditions of production. The Public Health Department of the London County Council could insure a healthy supply, and the saving which would be effected by its organization and systematic distribution, as well as by the abolition of the large profits of the wholesale dealers, would insure a lowering of price.

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* 'The Bacteriology of Milk,' Swithinbank and Newman.

The London County Council should arrange a supply of milk for all the elementary schools in London, and every morning half a pint of milk could be given to each of the scholars (as is done in many high schools), and in this way something could be done to build up the physique and stamina of the children. The Physical Training Committee says in its Report, p. 30:

'It would be in many cases an inestimable advantage could regular and sufficient meals—such as broth, porridge and milk, or bread and milk—be provided at a minimum cost.'

In this way the great institutions of London would be insured against danger from diseased milk. But the London boroughs should each establish several milk depots, to be situated in their poorest districts, managed on the lines suggested for the provinces, and where all kinds of milk could be obtained. These should be supplied from model farms owned and controlled by the London Borough Councils. Such an idea has been suggested by Sir Richard Douglas Powell in his lecture to the Sanitary Institute Congress: 'There can be no doubt that scientifically conducted dairy farms on a large scale, with urban depots for the reception and dispensing of pure milk in clean bottles, at a fair price, to the poor, would pay, and would be a most laudable employment of the municipal enterprise that is often devoted to matters of much less urgent public interest and importance. Apart from the primary benefit of affording a pure milk-supply at a fair price, the object-lesson to mothers and families in food-cleanliness would be beyond price.'*

In such a way as is outlined above the public would commence to take the next step in the direction of a publicly owned and controlled milk-supply. The vested interests are no more numerous than in the days when the sole water-supply of the poorer parts of cities was the private well, from which could be purchased a dangerous article at a maximum price. The impelling force is the same in both cases—namely, an increasing appreciation of the need for the utmost care in the production of food and drink, and it is only increased interest in this question that is needed to complete the municipalization of milk—at least, in some of our towns. It is not by epigrams, but by epidemics, that people are being persuaded to take in hand seriously the supply of the necessaries of life.

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* *Journal of the Sanitary Institute*, August, 1904, p 350.

If we municipalize water because the public health aspect is of such vital importance, then from the same standpoint we should municipalize the milk-supply. We nearly all need milk—many live on it exclusively; its supply is as regular as is the water-supply, and its distribution demands even greater care for a longer time. The milkman calls more regularly than the postman, and the milk bill comes in as regularly as the rate card. Like the liquor trade, the milk trade is a simple one, and the dividends of modern dairy companies show that it is profitable.

In the production of milk it is often necessary to stop the supply of one or more cows, or even to destroy them at once. This entails a loss to the producer, which is heavy just in proportion as he is a small man, and is not felt by a large industry; hence the main motive for concealment of the existence of diseased animals—at the present time a grave source of danger—disappears when the community carries out the supply itself.

The housing of the cows is almost as important as the housing of the consumers of milk, and should not be left in the hands of men who have neither the knowledge nor the capital to house them properly. The milking and other dairy processes are skilled occupations, and need a knowledge and appreciation of cleanliness much beyond that which can be expected of the present underpaid labourers. The presence of disease in the home of anyone connected with the milk trade may cause serious mischief to large numbers, and great loss of time and money to the community; therefore such men should be the employés of those who are interested financially in the public health (as all ratepayers are), and they should be paid full wages when their absence from such a cause is necessitated. And we know that at present concealment is often carried out for fear of losing wages, and is winked at by the small employer for fear of losing hands.

We should bear in mind that, although under present conditions of supply any stringent enforcement of the most thorough sanitary regulations on farmers, or any distinct raising of the legal minimum of fat in milk, would certainly tend to raise the price of milk to the consumer, and any rise in price would be most unfortunate, yet a high standard of production and distribution is essential. The only way to get both low price and a better article is by means of the enormous economies in distribution, cartage, etc., which would at once result from municipal ownership.

Services of distribution are doubled and trebled under present circumstances, and the consumer has to pay. For instance, at a small village two miles from a Kentish borough five milk-carts drive in daily for orders which could all be carried out by any one of them. By economies in distribution and elimination of the middleman Dr. Rothschild makes a profit of £1,000 per annum on his depots in Paris, although he sells his milk at about two-thirds the price of the ordinary retail dealer.

Cleanly production of milk and proper distribution in sealed bottles again reduces the cost of distribution by allowing only one delivery per diem instead of two, on account of the increased keeping powers of well-produced milk.

Finally, it has been shown that all successful attempts to solve the question have been those in which the aim has been other than the ordinary commercial one, and those organizing the supply have been interested in the public health, and in which there has been thorough organization on a large scale both in supply and distribution. These facts alone show that the only solution possible under modern conditions is that suggested by the municipal ownership and control of the milk-supply.

THE END.

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